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WATER SUPPLY OUTLOOK FOR WESTERN UNITED STATES

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CURRENT SERIAL RECORDS

Including Columbia River Drainage in Canada

and
FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS

UNITED STATES DEPARTMENT of AGRICULTURE...SOIL CONSERVATION SERVICE

Collaborating with

CALIFORNIA DEPARTMENT of WATER RESOURCES

and

BRITISH COLUMBIA DEPARTMENT of
LANDS, FORESTS and WATER RESOURCES

AS OF
FEB. 1, 1967

TO RECIPIENTS OF WATER SUPPLY OUTLOOK REPORTS:

Most of the usable water in western states originates as mountain snowfall. This snowfall accumulates during the winter and spring, several months before the snow melts and appears as streamflow. Since the runoff from precipitation as snow is delayed, estimates of snowmelt runoff can be made well in advance of its occurrence. Streamflow forecasts published in this report are based principally on measurement of the water equivalent of the mountain snowpack.

Forecasts become more accurate as more of the data affecting runoff are measured. All forecasts assume that climatic factors during the remainder of the snow accumulation and melt season as they affect runoff will add to be an effective average. Early season forecasts are therefore subject to a greater change than those made on later dates.

The snow course measurement is obtained by sampling snow depth and water equivalent at surveyed and marked locations in mountain areas. A total of about ten samples are taken at each location. The overage of these are reported as snow depth and water equivalent. These measurements are repeated in the same location near the same dates each year.

Snow surveys are made monthly or semi-monthly from January 1 through June 1 in most states. There are about 1400 snow courses in Western United States and in the Columbia Basin in British Columbia. In the near future, it is anticipated that automatic snow water equivalent sensing devices along with radio telemetry will provide a continuous record of snow water equivalent at key locations.

Detailed data on snow course and soil moisture measurements are presented in state and local reports. Other data or reservoir storage, summaries of precipitation, current streamflow, and soil moisture conditions at valley elevations are also included. The report for Western United States presents a broad picture of water supply outlook conditions, including selected streamflow forecasts, summary of snow accumulation to date, and storage in larger reservoirs.

Snow survey and soil moisture data for the period of record are published by the Soil Conservation Service by states about every five years. Data for the current year is summarized in a West-wide basic data summary and published about October 1 of each year.

Listed below are water supply outlook reports based on Federal-State-Private Cooperative snow surveys. Those published by the Soil Conservation Service may be obtained from Soil Conservation Service, Room 507, Federal Building, 701 N. W. Glisan, Portland, Oregon 97209.

PUBLISHED BY SOIL CONSERVATION SERVICE

D. A. WILLIAMS, Administrator

The Soil Conservation Service publishes reports following the principal snow survey dates from January 1 through June 1 in cooperation with state water administrators, agricultural experiment stations and others. Copies of the reports for Western United States and all state reports may be obtained from Soil Conservation Service, Western Regional Technical Service Center, Room 507, 701 N. W. Glisan, Portland, Oregon 97209.

Copies of state and local reports may also be obtained from state offices of the Soil Conservation Service in the following states:

STATE	ADDRESS
Alaska	P. O. Box "F", Palmer, Alaska 99645
Arizona	6029 Federal Building, Phoenix, Arizona 85205
Colorado (N. Mex.)	12417 Federal Building, Denver, Colorado 80202
Idaho	P. O. Box 38, Boise, Idaho 83701
Montana	P. O. Box 855, Bozeman, Montana 59715
Nevada	P. O. Box 4850, Reno Nevada 89505
Oregon	1218 S. W. Washington St., Portland, Oregon 97205
Utah	4001 Federal Building, Salt Lake City, Utah 84111
Washington	840 Ban Marche Bldg., Spokane, Washington 99206
Wyoming	P. O. Box 340, Casper, Wyoming 82602

PUBLISHED BY OTHER AGENCIES

Water Supply Outlook reports prepared by other agencies include a report for California by the Water Supply Forecast and Snow Surveys Unit, California Department of Water Resources, P. O. Box 388, Sacramento, California 95802 --- and for British Columbia by the Department of Lands, Forests and Water Resources, Water Resources Service, Parliament Building, Victoria, British Columbia



WATER SUPPLY OUTLOOK
and
FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS
for
WESTERN UNITED STATES
Including Columbia River Drainage in Canada

ISSUED

FEBRUARY 1, 1967

The Soil Conservation Service coordinates snow surveys conducted by its staff and many cooperators, including the Bureau of Reclamation, Corps of Engineers, Forest Service, National Park Service, Weather Bureau, Geological Survey, and other Federal Agencies, Departments of State Government, Irrigation Districts, Power Companies, and others.

The Department of Water Resources coordinates snow surveys in California.

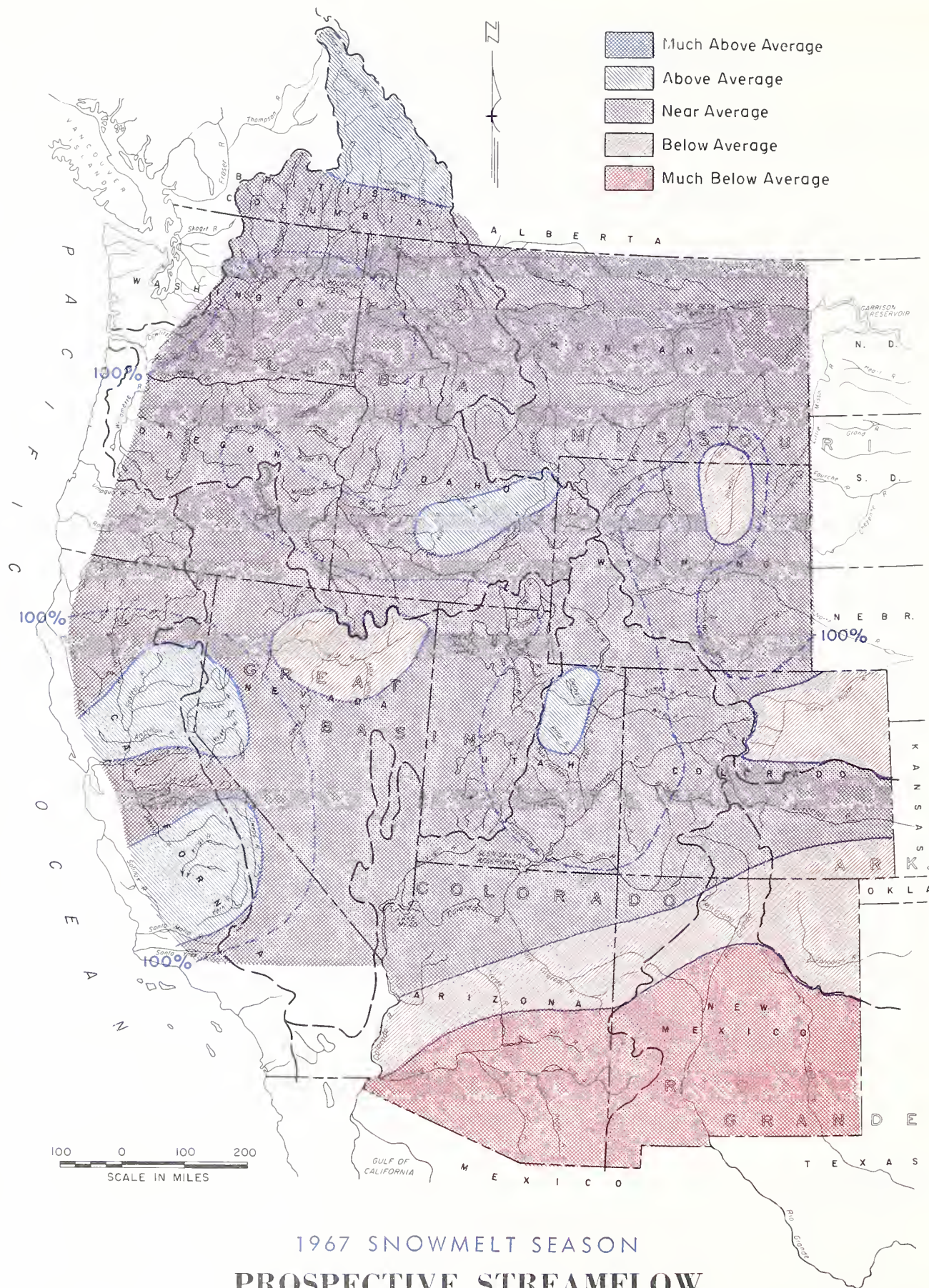
The Water Resources Service, Department of Lands, Forests, and Water Resources directs snow surveys in British Columbia.

This report was prepared by the Water Supply Forecasting Branch, Engineering Division, Soil Conservation Service, from data supplied by Snow Survey Supervisors of the Soil Conservation Service in the States of Alaska, Arizona, Colorado and New Mexico, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming.

Data from California was supplied by the Chief, Water Supply Forecast and Snow Survey Unit, Department of Water Resources.

Data from British Columbia was supplied by the Chief, Hydrology Division, Water Investigations Branch, Department of Lands, Forests and Water Resources.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
D. A. WILLIAMS, ADMINISTRATOR



1967 SNOWMELT SEASON
PROSPECTIVE STREAMFLOW
 AS OF FEBRUARY 1, 1967

WATER SUPPLY OUTLOOK

As of February 1, 1967

WATER SUPPLY OUTLOOK FOR 1967 IS FOR ADEQUATE SUPPLIES IN MOST AREAS. LESS THAN AVERAGE STREAMFLOW IS IN PROSPECT EAST OF THE DIVIDE IN COLORADO AND NEW MEXICO AND FOR LOWER COLORADO RIVER TRIBUTARIES IN ARIZONA.

Near the middle of the snow accumulation season, the probabilities are for average or better streamflow during the snowmelt season of 1967.

Some deficiency of runoff is expected for the South Platte and Arkansas in Colorado and on the Rio Grande in New Mexico. Surface streamflow in Arizona will probably be near a minimum of record, but high carryover storage will provide better than average surface water supply. For most western areas, the prospective streamflow plus near average carryover storage will provide a reasonably adequate water supply.

The California Department of Water Resources reports that the snowpack and other factors affecting water outlook in California are above normal for this date. Thus, with normal precipitation during the remainder of the snow season, the outlook is for above normal water supply for all major water use areas of the state.

SNOWPACK

Snowpack, to date, is generally above average this year. Warm temperatures have prevailed which has tended to concentrate the heaviest snowpack at higher elevations.

Near average snowfall exists in the mountains of much of the Columbia Basin. However, in the heavy water producing areas on the headwaters of the upper Columbia, Kootenai and Clark Fork Rivers high elevation snowpack is near or exceeds previous records for February 1. Other areas of heavy snowfall include the Sierras of California and a small section of the Colorado-Great Basin Divide in Utah.

Areas of deficient snowfall include the South Platte in Colorado, the Rio Grande in New Mexico and the headwaters area of the Salt, Gila and Little Colorado in Arizona. Near average snowfall has occurred over the upper Colorado River Basin and tributaries to the Yellowstone in Wyoming.

The snow season was late in starting. Much of the present snowpack was deposited in late December and during January.

STORAGE

Storage in both power and irrigation reservoirs is near average. Because of heavy demands in 1966, storage on the Snake River in Idaho and on the Platte in Wyoming is well below a year ago. Except for Washington, California and Arizona, irrigation storage on practically all streams is below that of last year following a heavy runoff in 1965. Total storage in these three states equals or exceeds that of a year ago. Major reservoirs on both the Colorado and Missouri main stems have substantial, unfilled capacity.

STREAMFLOW FORECASTS

The Columbia at The Dalles, Oregon and the Missouri River at Williston, North Dakota are expected to have flows about ten percent in excess of average and well above that for the 1966 snowmelt season. Inflow to Lake Powell on the Colorado River will probably be average, also in excess of flow for 1966. Tributary streams to the Columbia and Missouri will have higher flows in respect to average, while the Colorado River tributaries are expected to follow the pattern of the main stream.

Forecasts of California Central Valley streams are all well in excess of average for the April-July 1967 period. Most favorable flows are expected from Central Sierra streams and from the Kern River in the southern San Joaquin Valley.

MISSOURI BASIN

On the upper Missouri and its tributaries in Montana, snow accumulation during the past month has greatly improved the water supply outlook. Major headwater streams of the Missouri River are expected to flow from near average to 130 percent of average. Similar flows are anticipated from streams flowing into the Missouri from the Continental Divide in northern Montana. Overall flow of the Missouri and Yellowstone rivers is expected to be slightly above average. If average mountain snowfall occurs for the remainder of the season, water supply will be adequate even along the smaller streams with relatively heavy demands. Irrigation reservoirs are expected to fill.

SUMMARY OF SNOW WATER EQUIVALENT MEASUREMENTS

FEBRUARY 1, 1967

MAJOR BASIN AND SUB - WATERSHED	WATER EQUIVALENT IN PERCENT OF :		MAJOR BASIN AND SUB - WATERSHED	WATER EQUIVALENT IN PERCENT OF :	
	LAST YEAR	AVERAGE		LAST YEAR	AVERAGE
MISSOURI BASIN			SNAKE BASIN		
Jefferson	166	128	Snake above Jackson, Wyo.	133	117
Madison	195	147	Snake above Hiese, Idaho	135	113
Gallatin	196	128	Snake abv.American Falls Res.	148	123
Missouri Main Stem	214	113	Henry's Fork	196	157
Yellowstone	146	123	Southern Idaho Tributaries	157	116
Shoshone	127	99	Big and Little Wood	150	131
Wind	154	110	Boise	133	120
North Platte	125	97	Owyhee	200	115
South Platte	125	75	Payette	150	100
			Malheur	165	100
			Weiser	150	110
			Burnt	180	100
			Powder	160	100
			Salmon	155	119
			Grande Ronde	150	101
			Clearwater	117	108
ARKANSAS BASIN			LOWER COLUMBIA BASIN		
Arkansas	104	90	Yakima	78	88
Canadian	51	37	Umatilla	110	88
			John Day	120	94
			Deschutes - Crooked	90	100
			Hood	73	86
			Willamette	84	97
			Lewis	79	129
			Cowlitz	101	119
RIO GRANDE BASIN			PACIFIC COASTAL BASIN		
Rio Grande (Colo.)	92	103	Puget Sound	113	102
Rio Grande abv.Otowi Bridge	85	96	Olympic Peninsula	117	123
Pecos	30	50	Umpqua - Rogue	74	99
			Klamath	95	105
			Trinity	85	125
COLORADO BASIN			CALIFORNIA CENTRAL VALLEY		
Green (Wyo.)	144	104	Upper Sacramento	85	130
Yampa - White	111	92	Feather	130	160
Duchesne	128	134	Yuba	130	150
Price	141	134	American	120	140
Upper Colorado	114	99	Mokelumne	105	110
Gunnison	115	108	Stanislaus	110	120
San Juan	97	108	Tuolumne	125	135
Dolores	104	114	Merced	105	120
Virgin	92	100	San Joaquin	115	130
Gila	13	23	Kings	130	160
Salt	23	38	Kaweah	115	130
			Tule	110	120
			Kern	190	210
GREAT BASIN			<i>Data for California Watersheds supplied by Dept. of Water Resources, and for British Columbia Watersheds by Dept. of Lands, Forests and Water Resources.</i>		
Bear	116	100			
Logan	104	93	<i>Average is for 1948-62 period. California aver- ages are for the period 1931-1960. Based on Selected Snow Courses determined by Dis- tribution within the Basin, Length of Record and Repetitive Monthly Measurement Schedules.</i>		
Ogden	99	91			
Weber	115	106			
Provo - Utah Lake	150	130			
Jordan	124	101			
Sevier	106	96			
Walker - Carson	125	163			
Tahoe - Truckee	133	156			
Humboldt	109	148			
Lake Co. (Oregon)	129	132			
Harney Basin (Oregon)	155	101			
UPPER COLUMBIA BASIN					
Columbia (Canada)	141	155			
Kootenai	116	134			
Clark Fork	146	110			
Bitterroot	195	110			
Flathead	132	120			
Spokane	117	89			
Okanogan	132	127			
Methow	138	126			
Chelan	148	122			
Wenatchee	73	81			

Snowpack on Wyoming tributaries to the Yellowstone is near average for February 1 except for the Bighorn mountains where snowfall has been deficient. If snowfall for the remainder of the season is average, water supply will be adequate for the Wind River and its tributaries above Boysen Dam and for the tributary streams in the Powell Basin.

Outlook for streamflow on the North Platte is for near average flow this year. Even with less than average carryover storage, total supplies in prospect should be adequate to meet irrigation needs. Storage in Pathfinder and Seminoe is a small fraction of average and capacity.

Snowfall on the South Platte drainage has been deficient. With less than normal carryover storage in most of the small irrigation reservoirs, as well as the Colorado-Big Thompson Project, a continued deficit in snowfall could restrict water use in 1967 for irrigation purposes in this heavy water demand area.

ARKANSAS BASIN

Streamflow forecasts for the main stem of the Arkansas River are for near average flow during the snowmelt period. Carryover storage is below that of a year ago, but better than in many years. The general water outlook as of late winter is fair to good, depending to some degree on the irrigation district. Unless heavy spring storms occur, the flow of southern tributaries to the Arkansas in Colorado will be less than half of average.

Snowfall is also deficient on the Canadian River headwaters in New Mexico. Storage for the Tucumcari project is reasonably adequate for the season.

RIO GRANDE BASIN

Snowfall during the first half of the season has been near average along the Continental Divide in Colorado, the source area of the Rio Grande. Snowpack in northern New Mexico is extremely deficient. As of this date, it appears surface water supplies will be barely adequate in the San Luis Valley. Another year of surface water shortage is in prospect along the Rio Grande in New Mexico. Carryover storage for the middle and lower Rio Grande Districts is roughly comparable to a year ago and near average for recent years.

COLORADO BASIN

Snowfall to February 1 has been near average along the Continental Divide in Colorado and Wyoming, the major water producing area for the upper Colorado River and its tributaries. At this time it appears that the flow of the Green, Yampa, White, Upper Colorado, Gunnison and San Juan will be near average during the snowmelt season. Variation in late season snow-

fall on this stream is substantial, so a change in outlook could easily occur if there is a wide deviation from normal snowfall from now through April and May.

Present snowpack is much above average for the central Utah area on the headwaters of the Price and Duchesne Rivers. Even this early in the season, average or better water supplies are reasonably assured in this area.

Water supplies for local use along the major streams of the upper basin will probably be adequate. Storage on the larger reservoirs of the upper Colorado system, including Lake Mead, now totals about 27,000,000 acre-feet which is comparable to a year ago on this date.

For the Central Valley Project of Arizona, streamflow prospects are poor at this time. Winter snowfall has been limited. Temperatures have been warm. Most precipitation during the winter months has been rainfall. Much of the snowfall which has occurred has melted.

In contrast, carryover storage from the high runoff season of 1965-66 will provide a much above average surface water supply for irrigated areas served by the major reservoirs on the Verde, Salt and Gila. Some shortages are in prospect for the direct diversion rights on the upper Gila and along the Little Colorado River.

Inflow to Lake Powell will probably be near average for the April-July 1967 period, slightly more than for 1966, but less than that of two years ago.

GREAT BASIN

Above average streamflow prospects and carryover reservoir storage indicates a favorable water supply for the Great Basin area of Utah in 1967. The better outlook is in central Utah in the area served by the Spanish Fork, American Fork and Provo Rivers. Near average flows are anticipated for Bear River tributaries in northern Utah. Total storage in major reservoirs is near average for this date with some increases in January.

Heavy January storms in the central Sierra have left an extremely favorable outlook for the east slope of Sierra streams in west central Nevada. Streamflow is expected to be about 125 percent of average for the April-July 1967 period. Soil moisture at both mountain and valley elevations is good for this time of year.

The outlook is less favorable along the Humboldt. With much of the snow accumulation season yet to come, flows in the range of 75 percent of average are anticipated.

Reservoir storage is slightly better than average for the principal irrigated areas.

SELECTED STREAMFLOW FORECASTS

APRIL-SEPTEMBER 1967 as of FEBRUARY 1, 1967

STREAM AND STATION	1000 ACRE-FEET		PERCENT OF AVERAGE
	FLOW	FORECAST	
UPPER MISSOURI	1966	1967	
Jefferson at Sappington, Montana		1050	108
Madison near Grayling, Montana <u>1/</u>		470	112
Gallatin near Gateway, Montana		540	120
Missouri near Zortman, Montana <u>2/</u>		5050	112
Sun at Gibson Dam, Montana <u>3/</u>	450	650	106
Marias near Shelby, Montana <u>4/</u>	435	700	107
Milk near Eastern Crossing, Montana			
Yellowstone at Livingston, Montana		2260	106
Shields at Clyde Park, Montana			
Clark Fork at Chance, Montana		610	105
Shoshone, Inflow to Buffalo Bill Res., Wyo.		797	99
Wind at Dubois, Wyoming		96	96
Bull Lake near Lenore, Wyoming		171	97
Tensleep near Tensleep, Wyoming		61	85
Yellowstone at Miles City, Montana <u>5/</u>		6300	109
Missouri near Williston, N. Dakota <u>6/</u>		11950	109
PLATTE			
North Platte at Saratoga, Wyoming		690	108
Laramie near Jelm, Wyoming <u>7/</u>			
Clear at Golden, Colorado		116	86
St. Vrain at Lyons, Colorado		60	75
Cache LaPoudre near Fort Collins, Colorado <u>8/</u>		180	78
ARKANSAS			
Arkansas at Salida, Colorado <u>9/</u>		340	98
Purgatoire at Trinidad, Colorado		20	45
RIO GRANDE			
Rio Grande near Del Norte, Colorado <u>10/</u>		400	82
Conejos near Mogote, Colorado <u>11/</u>		180	92
Rio Chama near LaPue, New Mexico		175	82
Rio Grande at Otowi Bridge, New Mexico <u>12/</u>		350	58
Pecos at Pecos, New Mexico *		32	60
UPPER COLORADO			
Colorado near Granby, Colorado <u>13/</u>		235	100
Colorado near Glenwood Springs, Colorado <u>14/</u>		1560	100
Roaring Fork at Glenwood Springs, Colorado <u>15/</u>		760	100
Gunnison at Grand Junction, Colorado		1260	97
Dolores at Dolores, Colorado		260	100
Colorado near Cisco, Utah		3800	100
Green below Flaming Gorge Res., Utah <u>16/</u>		1150	102
Yampa at Steamboat Springs, Colorado		275	95
White at Meeker, Colorado		300	91
Duchesne near Tabiona, Utah <u>17/</u>		137	120
Rock Creek near Mountain Home, Utah		114	112
Price near Scofield, Utah <u>18/</u>		52	141
Green at Green River, Utah <u>16/</u>		3400	101
San Juan near Rosa, New Mexico		525	88
Animas at Durango, Colorado		460	101
San Juan near Bluff, Utah <u>19/</u>		1075	92
Colorado, Inflow to Lake Powell, Arizona <u>20/**</u>		7800	101
LOWER COLORADO			
Gila near Solomon, Arizona (Jan-May)	351	41	30
Salt at Intake, Arizona (Jan-May)	554	133	42
Verde above Horseshoe Dam, Arizona (Jan-May)	221	145	78

SELECTED STREAMFLOW FORECASTS

APRIL-SEPTEMBER 1967 as of FEBRUARY 1, 1967

STREAM AND STATION	1000 ACRE-FEET		PERCENT OF AVERAGE
	FLOW	FORECAST	
GREAT BASIN	1966	1967	
Bear at Harer, Idaho	208	270	105
Logan near Logan, Utah <u>21/</u>		129	97
Ogden, Inflow to Pine View Res., Utah <u>22/</u>		120	93
Weber near Oakley, Utah		132	107
Inflow to Utah Lake, Utah		310	110
Big Cottonwood near Salt Lake City, Utah		39	100
Beaver near Beaver, Utah		28	115
South Fork Humboldt near Elko, Nevada			
Humboldt at Palisades, Nevada **		130	75
Truckee at Farad, California <u>25/</u>			
East Carson near Gardnerville, Nevada			
West Walker near Coleville, California **		190	136
Owens, below Long Valley Dam, California			
UPPER COLUMBIA			
Columbia at Revelstoke, British Columbia			
Kootenai at Wardner, British Columbia			
Kootenai at Leonia, Idaho	9176	10400	112
Flathead near Columbia Falls, Montana <u>26/</u>	5656	7350	113
Flathead near Polson, Montana <u>26/</u>	6879	8850	114
Clark Fork above Missoula, Montana	1197	1960	107
Bitterroot near Darby, Montana	278	630	108
Clark Fork at Whitehorse Rapids, Montana <u>26/</u>	11474	15800	110
Columbia at Birchbank, British Columbia <u>26/</u>			
Spokane at Post Falls, Idaho <u>27/</u>			
Columbia at Grand Coulee, Washington <u>26/</u>		80400	105
Okanogan near Tonasket, Washington			
Chelan at Chelan, Washington <u>28/</u>			
Wenatchee at Peshastin, Washington			
SNAKE			
Snake above Palisades Res., Wyoming <u>29/</u>		2810	108
Snake near Heise, Idaho <u>29/</u>		4050	105
Henry's Fork near Rexburg, Idaho <u>30/</u>			
Big Lost near Mackay, Idaho <u>31/</u>		185	126
Big Wood, Inflow to Magic Res., Idaho <u>32/</u>		340	107
Bruneau near Hot Springs, Idaho			
Owyhee Res., Net Inflow, Oregon (Feb-July)		650	122
Boise near Boise, Idaho <u>33/</u>		1800	110
Malheur near Drewsey, Oregon (Feb-July)		145	119
Payette near Horseshoe Bend, Idaho <u>34/</u>		2100	106
Snake at Weiser, Idaho		6700	96
Salmon at Whitebird, Idaho		7600	109
Clearwater at Spalding, Idaho		9500	103
LOWER COLUMBIA			
Grande Ronde at LaGrande, Oregon (Mar-Sept)		214	87
Yakima at Cle Elum, Washington <u>35/</u>			
Deschutes at Benham Falls, Oregon <u>36/</u>		678	107
Columbia at The Dalles, Oregon <u>26/</u>		119500	110
Hood near Hood River, Oregon <u>36/</u>		305	80
Willamette at Salem, Oregon <u>36/</u>		4940	89
Lewis at Ariel, Washington <u>37/</u>			
Cowlitz at Castle Rock, Washington			

Forecasts in California provided by Department of Water Resources.
Average is for 1948-62 period except California. California is computed for
Forecasts assume average Effective Climatic Conditions from Date Through Snow Melt Season.

Explanatory Notes on Forecasts Listed on Inside Back Cover.
* April - June Period ** April - July Period

SELECTED STREAMFLOW FORECASTS

APRIL-SEPTEMBER 1967 as of FEBRUARY 1, 1967

STREAM AND STATION	1000 ACRE-FEET		PERCENT OF AVERAGE
	FLOW	FORECAST	
NORTH PACIFIC COASTAL	1966	1967	
Dungeness near Sequim, Washington			
Rogue at Raygold, Oregon		879	88
Klamath Lake, Net Inflow, Oregon (Feb-Sept)		928	93
CALIFORNIA CENTRAL VALLEY 38/**			
Sacramento, Inflow to Shasta, California	1598	1240	118
Feather near Oroville, California	1324	2700	138
Yuba at Smartville, California	770	1500	133
American, Inflow to Folsom Res., Calif.	761	1690	122
Cosumnes at Michigan Bar, California	54	150	115
Mokelumne, Inflow to Pardee Res., Calif.	286	570	119
Stanislaus, Inflow to Melones Res., Calif.	463	830	113
Tuolumne, Inflow to Don Pedro Res., Calif.	767	1320	109
Merced, Inflow to Exchequer Res., Calif.	387	670	108
San Joaquin, Inflow to Millerton Lake, Calif.	837	1480	122
Kings, Inflow to Pine Flat Res., California	825	1600	136
Kaweah, Inflow to Terminus Res., California	149	385	146
Tule, Inflow to Success Res., California	13	75	134
Kern, nr. Bakersfield, California	220	700	162

Forecasts in California provided by Department of Water Resources.

Average is for 1948-62 period except California. California is computed for

Forecasts assume average Effective Climate Conditions from Date Through Snow Melt Season.

Explanatory Notes on Forecasts listed on Inside Back Cover.

* April - June Period

** April - July Period

COLUMBIA BASIN

Seasonal snow accumulation to February 1 was near average for most of the Columbia Basin. However, in the heavy water producing areas along the Continental Divide in Idaho and Montana, and on the headwaters of the Kootenai and upper Columbia in Canada, February 1 snow measurements were much above average. The present outlook is for snowmelt season flow of about 110 percent of average for the Columbia at The Dalles, Oregon.

The British Columbia Water Resources Service reports that snowpack in all mountain regions is heavier than usual for this time of year. Distribution is such that the well above average snowpack is concentrated at the higher elevations on the Columbia and Kootenai watersheds. Highest February 1 measurements of record have been obtained at several stations above 4,000 feet with records extending back as much as 25 years. Near average snowpack remains at lower elevations. This is credited to mild weather during the snow accumulation period. Much greater than average flows are anticipated for the 1967 summer season.

Slightly less snowpack has accumulated in the headwaters of the Clark Fork and tribu-

aries in western Montana. Present snowpack is about 125 percent of average. Here, also, the heavier snowpack is concentrated at the higher elevations. Although much of the seasonal snowpack is yet to come, the most probable summer flow indicated at this time is about 110 percent of average for the Clark Fork at Whitehorse Rapids, Montana and slightly higher on some tributaries. Water supply will be adequate.

Water supply outlook along the Snake River in Idaho has taken a dramatic turn for the better as a result of heavy storms during January. Water supply forecasts range from near average for the Spokane River in north-western Idaho to about 125 percent of average for upper Snake River tributaries in eastern Idaho. As with other areas in the basin, snowpack tends to be heavier at the higher mountain elevations. Soil moisture is reported as fair to good at valley and foothill elevations. Soil moisture under the snow in the mountains is still deficient, a factor remaining from the drouth period of the fall months. The improvement in streamflow prospects during January will overcome, to a substantial degree, the deficiency in reservoir storage along the Snake River.

Snowpack in the Washington Cascade range is above average at elevations above 4,500 feet and poor to nonexistent at lower elevations. Soil in mountain areas is wetter than usual. Reservoir storage is near average on the Yakima and represents a substantial improvement over a year ago. They are expected to fill early during the snowmelt season.

Snowpack in Oregon is near average for the entire state with a tendency toward heavier snow at the higher elevations. If snowfall for the remainder of the season follows this pattern, near average flows are expected for the summer months. These flows, along with storage, should provide an adequate water supply except for possible shortages on areas served by Wallowa Lake and McKay reservoirs in northeast Oregon and Four Mile Lake in southwest Oregon. Outlook for major irrigated regions on the Owyhee and Malheur in eastern Oregon is good with carryover storage.

CALIFORNIA

The California Department of Water Resources, coordinating agency for snow surveys and water supply forecasting in California, reports that California's precipitation for the 1966-67 season to date is generally well above normal. The Sierra and Cascade snowpack on February 1 is equal to or in excess of normal for this date. Thus, with normal precipitation during the remainder of the season, water supply for California water users will be above average in most areas, a welcome situation after last year's long winter and summer drought.

The 1966-67 season started slow with many precipitation stations recording the first October with zero rainfall in over thirty years. This drought condition was broken during the first week of November. By Jan-

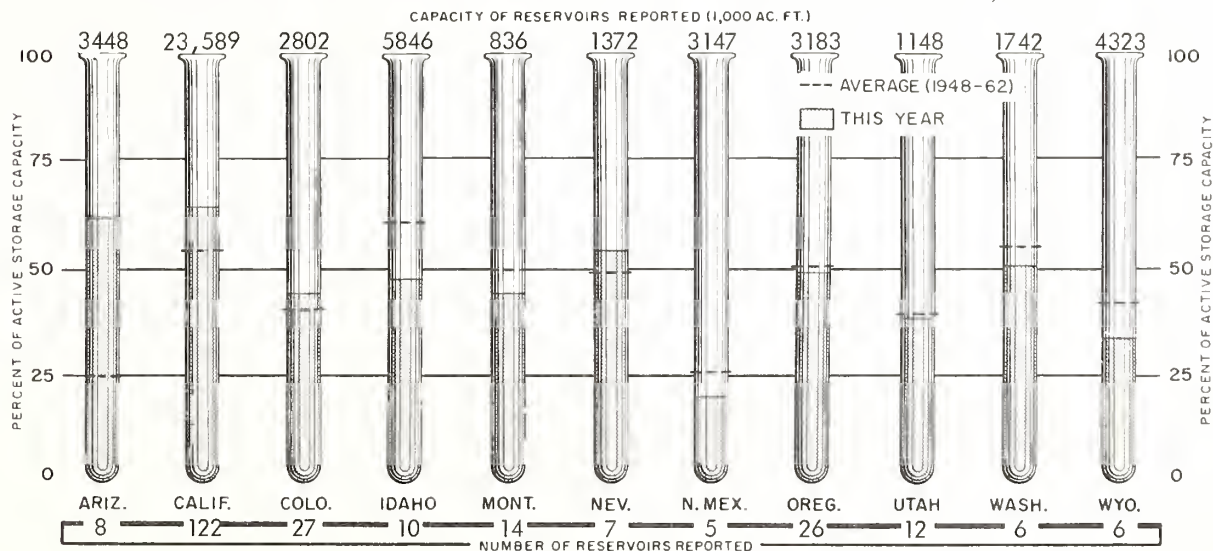
uary 1 precipitation was 145 percent of normal for this date with southern Sierra drainages and the San Gabriel mountains having received between 2 and 5 times normal amounts of seasonal precipitation for the period. During the first week of December, record 24 hour rainfall amounts were established for many stations in the southern Sierra drainages.

Most of the precipitation during January fell during the stormy period which began on the 19th and continued through the end of the month. Near record 24 hour amounts were recorded on the 21st from the San Francisco Bay area northward to the Russian river. Statewide the January precipitation was 155 percent of normal for the month. All areas were above normal with less than normal amounts occurring only in the Tulare Lake basin, the San Diego River basin and the desert area. For the period October through January the precipitation was about 150 percent of normal.

Forecasts of runoff for major Central Valley streams, based on normal precipitation to follow averaged about 126 percent of normal. Forecasts for individual basins varied from a low of 108 percent of normal for the Merced River in the central Sierras to a high of 162 percent of normal for the Kern River in the southern Sierras.

February 1 snow surveys indicate that the snowpack water content is average or above in all Cascade and Sierra watersheds. Sierra snowpack is lightest with respect to normal in the central regions where it ranges from 120 to 135 percent of the average for February 1. The pack increases to about 150 percent of normal in northern Sierra watersheds and to over 200 percent of normal in the Kern River basin. Generally, the

RESERVOIR STORAGE as of FEBRUARY 1, 1967



STORAGE IN LARGE RESERVOIRS FEBRUARY 1, 1967

BASIN AND NAME OF RESERVOIR	CAPACITY (1000 A.F.)	STORAGE (1000 A.F.)	BASIN AND NAME OF RESERVOIR	CAPACITY (1000 A.F.)	STORAGE (1000 A.F.)
UPPER MISSOURI			UPPER COLUMBIA		
Boysen	952	596	Chelan	676	255
Buffalo Bill	380	223	Coeur d'Alene	238	238
Canyon Ferry	2043	1307	Flathead	1791	1374
Hebgen	385	169	Hungry Horse	2982	1825
Tiber	1316	489	Kootenay	673	570
			Pend Oreille	1155	610
Belle Fourche	185	87	Roosevelt	5232	3473
Keyhole	190	119			
			LOWER COLUMBIA		
Fort Peck	19410	15590	Cougar	155	28
Fort Randall	5800	2983	Detroit	300	78
Garrison	24500	16860	Hills Creek	200	47
Oahe	23600	14280	Lookout Point	337	55
Yellowtail	1356	656	Yakima Res. (5)	1066	631
Big Bend	1900	1723			
PLATTE			SNAKE		
Glendo	786	305	American Falls	1700	1108
Pathfinder	1011	146	Arrowrock	287	122
Seminole	982	196	Anderson Ranch	423	167
City of Denver (6)	578	402	Brownlee	1437	1167
Colo-Big Thompson (4)	865	318	Cascade	653	112
			Jackson	847	498
ARKANSAS			Lucky Peak	278	51
Conchas	280	183	Palisades	1202	465
John Martin	367	196	Owyhee	715	325
RIO GRANDE			PACIFIC COASTAL		
Elephant Butte	2207	390	Cachuma	205	206
El Vado	194	---	Casitas	254	109
			Clair Engle	2500	1900
UPPER COLORADO			Clear Lake	440	176
Flaming Gorge	3789	2165	Nacimiento	350	252
Navajo	1709	397	Ross	1203	1132
Powell	28040	7660	Upper Klamath	584	335
Blue Mesa		366			
			CALIFORNIA CENTRAL VALLEY		
LOWER COLORADO			Almanor	1036	648
Havasu	619	546	Berryessa	1602	1680
Mead	27209	15629	Comanche	432	156
Mohave	1709	1143	Don Pedro	290	165
San Carlos	1206	322	Folsom	1010	620
Salt River Res. (4)	1755	1470	Hetch-Hetchy	360	130
Verde River Res. (2)	322	205	Isabella	570	230
			McClure	1026	443
GREAT BASIN			Millerton	521	440
Bear	1421	1059	Pine Flat	1013	647
Lahontan	286	160	Shasta	4500	3511
Rye Patch	179	70			
Sevier Bridge	236	554			
Strawberry	270				
Tahoe	732	451			
Utah	1149	593			

Reservoir Storage Data Provided by Bureau of Reclamation, Corps of Engineers, Geological Survey, and water using organizations. Data from California and British Columbia provided by Department of Water Resources and Department of Lands, Forests and Water Resources, respectively.

higher elevation watersheds have a much greater snowpack with respect to the February 1 normal, having retained a greater percentage of the snow that fell during the late November and early December storms.

Unimpaired runoff of California's major streams for the period of October through January was well above average. During the first week of December a warm, intense storm caused record breaking floods in the southern Sierra drainages and Salinas River in the central coastal area. Resulting peak flows on the Kern and Tule Rivers were over twice as great as previous maximum recorded

flood flows. The peak flows on the Salinas river and its tributaries also exceeded the previous maximum of record.

Based on February 1 storage values for 122 reservoirs in California which have a combined usable capacity of 23,600,000 acre-feet, the storage is 123 percent of normal for February 1. This represents a net increase of 1,640,000 acre-feet of water in storage over last year at this time. Contents in major reservoirs are now at or below their normal flood control levels although releases were increased during the storms of early December and late January to maintain flood control space.



EXPLANATION of STREAMFLOW FORECASTS

All flows are observed flows except as adjusted for: 1/ Change in storage in Hebgen Lake. 2/ Change in storage in Canyon Ferry and Tiber reservoirs. 3/ Change in storage in Gibson Reservoir and measured diversions. 4/ Change in storage in Two Medicine, Four Horns and Lake Francis reservoirs. 5/ Change in storage in Boysen and Buffalo Bill reservoirs.

6/ Change in storage in Boysen, Buffalo Bill, Canyon Ferry, Tiber, and Fort Peck reservoirs. 7/ Plus diversions to Cache la Poudre. 8/ Minus diversions from North Platte, Laramie, and Colorado rivers plus measured diversions above station. 9/ Change in storage in Twin Lakes and Sugar Loaf reservoirs minus diversions from Colorado River.

10/ Change in storage in Rio Grande, Santa Maria, and Continental reservoirs. 11/ Change in storage in Platoro Reservoir. 12/ Change in storage in El Vado Reservoir. 13/ Change in storage in Granby Reservoir plus diversions to Cache la Poudre and through Adams Tunnel. 14/ Changes as indicated in (13) plus Moffatt Tunnel diversion. 15/ Plus diversions to Arkansas River.

16/ Change in storage in Flaming Gorge and Big Sandy reservoirs. 17/ Plus diversion through Duchesne Tunnel. 18/ Change in storage in Scofield Reservoir. 19/ Change in storage in Navajo Reservoir. 20/ (Lee's Ferry) Change in storage in Flaming Gorge, Navajo, Lake Powell, and Big Sandy reservoirs.

21/ Plus Utah Power and Light Company tailrace and Logan, Hyde Park, and Smithfield canals. 22/ (Inflow record computed by U. S. Bureau of Reclamation.) 23/ Plus diversion by Weber-Provo Canal and change in storage in Wanship Reservoir. 24/ Change in storage in Deer Creek Reservoir, minus diversions through Duchesne Tunnel and Weber-Provo Canal, plus diversion through Salt Lake City Aqueduct. 25/ Change of storage in Lake Tahoe and Boca Reservoir. (Forecast by Truckee Basin Committee)

26/ Change in storage in any of these reservoirs above the station: Kootenai Lake, Hungry Horse, Flathead Lake, Pend Oreille Lake, F. D. Roosevelt Lake, Lake Chelan, Coeur d'Alene Lake, Brownlee and Noxon; and pumpage at Roosevelt Lake. 27/ Changes in storage in Coeur d'Alene Lake and diversions by Spokane Valley Farms Company and Rathdrum Prairie canals. 28/ Change in storage in Lake Chelan. 29/ Changes in storage for Jackson Lake and Palisades Reservoir above stations. 30/ Change in storage in Henry's Lake, Island Park and Grassy Lake reservoirs and diversions between Ashton and Rexburg.

31/ Change in storage in Mackay Reservoir, and diversion in Sharp Ditch. 32/ (Combined flow Big Wood River nr. Bellevue and Camas Creek nr. Blaine.) 33/ Change in storage in Arrowrock, Anderson Ranch, and Lucky Peak. 34/ Change in storage in Cascade and Deadwood reservoirs. 35/ Change in storage in Keechelus, Kachess, and Cle Elum reservoirs plus diversion by Kittitas Canal. 36/ (Corrected to natural flow). 37/ Change in storage in Merwin, Yale, and Swift reservoirs. 38/ (Corrected for upstream impairments).

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